AMENDMENTS TO THE CLAIMS

1-20. (Canceled)

21. (Currently amended) A sensing device for sensing a specific binding between an analyte and a recognition molecule, the sensing device comprising:

a patterned, localized, and individually addressable microelectronic sensor, the sensor comprising:

a solid substrate,

a bottom auxiliary layer atop the solid substrate,

an individually addressable activation element atop the bottom auxiliary layer, wherein the individually addressable activation element is configured to activate a sensor surface of the sensing device,

a top auxiliary layer atop the individually addressable activation element, and

an anchoring layer comprising electroactive moieties, wherein the anchoring layer is situated atop the top auxiliary layer, and wherein there is electrical access between the electroactive moieties and the individually addressable activation element, and

a plurality of self-aligned recognition molecules covalently bound atop the anchoring layer, wherein the anchoring layer with the plurality of self-aligned recognition molecules covalently bound thereto ~~comprises a~~ is the sensor surface ~~of the sensing device~~, wherein the individually addressable activation element is a thermal activation element configured to adjust a temperature of a part of the anchoring layer and the anchoring layer's immediate surroundings by heating or cooling or is an electrochemical activation element configured to adjust an oxidation state of a part of the anchoring layer through a locally applied voltage or current, wherein the part of the anchoring layer has an area of less than 1 mm^2, wherein a volume of the part of the anchoring layer's immediate surroundings, measured as extending into a space accessible by the recognition molecules, is less than 1 mm^3, and wherein the sensor is configured to electrochemically detect a specific binding between the recognition molecules and an analyte.

22. (Previously presented)The sensing device of claim 21, wherein the patterned, localized, and individually addressable microelectronic sensor comprises a field effect transistor.

23. (Previously presented)The sensing device of claim 21, comprising a plurality of sensor surfaces, wherein each sensor surface is individually addressable and individually activatable.

24. (Previously presented)The sensing device of claim 21, comprising a plurality of patterned, localized, and individually addressable microelectronic sensors.

25. (Canceled)

26. (Previously presented)The sensing device of claim 21, wherein the anchoring layer is selected from the group consisting of chemical molecules and a metal layer.

27. (Previously presented)The sensing device of claim 21, wherein the anchoring layer is activatable by electrochemical actuation.

28. (Previously presented)The sensing device of claim 21, wherein the individually addressable activation element is an electrochemical activation element.

29. (Previously presented)The sensing device of claim 28, wherein a surface layer of the patterned, localized, and individually addressable microelectronic sensor comprises a material configured to allow electron transfer over the surface layer.

30. (Previously presented)The sensing device of claim 29, wherein the material is selected from the group consisting of a metal, a thin oxide, a semiconductor, an organic layer, and combinations thereof.

31. (Previously presented)The sensing device of claim 21, wherein the activation element is a thermal activation element.

32. (Previously presented)The sensing device of claim 21, wherein the thermal activation element is selected from the group consisting of a resistor, a microwave heatable element, and a peltier element.

33-40. (Canceled)

41. (Previously presented)The sensing device of claim 21, wherein the device is a microelectronic chip.

42-49. (Canceled)

50. (Previously presented)A method for detecting an analyte, comprising:

providing a sensing device according to claim 21; and

electrochemically detecting a binding event between the recognition molecule and an analyte, wherein detection of the binding event is indicative of a presence of the analyte.

51. (Previously presented)The sensing device of claim 21, wherein the sensing device comprises a field effect transistor configured to act as the individually addressable activation element and as a sensor, wherein the field effect transistor is attached gate side down to the bottom auxiliary layer.

52. (Previously presented)The sensing device of claim 51, further comprising nano-wells or micro-wells created on a surface of the device and configured to confine heat flow for a duration of the binding event that occurs between the self-aligned recognition molecules and the anchoring layer.

52-53. (Canceled)

54. (Previously presented)The sensing device of claim 51, wherein the top auxiliary layer is a dielectric layer having a thickness of less than 10 nm, whereby electrical access to the anchoring layer by tunneling is permitted.

55. (Previously presented)The sensing device of claim 51, wherein the top auxiliary layer is a metal layer.

56. (Previously presented)The sensing device of claim 51, further comprising at least one deposition control structure comprising a temperature control element selected from the group consisting of Joule dissipative heaters and peltier elements, and at least one deposition control structure configured to control an oxidation state of electroactive moieties in the anchoring layer and selected from the group consisting of switched microelectrodes and non-switched microelectrodes.

57. (Previously presented)The sensing device of claim 56, further comprising a local temperature sensor configured to monitor a heating/cooling process and to provide control feedback for applied thermal power.

58. (Previously presented)The sensing device of claim 56, wherein the auxiliary bottom layer is configured to thermally isolate the temperature control element from the solid substrate and to assist in heat transfer towards the anchoring layer, and wherein the auxiliary

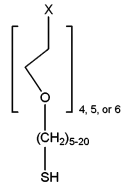
bottom layer comprises at least one material selected from the group consisting of an oxide, an oxynitride, and a polymer.

59. (Previously presented)The sensing device of claim 56, wherein the auxiliary bottom layer is configured to electrically isolate the microelectrode from the solid substrate.

60. (Currently amended) The sensing device of claim 21, wherein the sensing device comprises a ion sensitive field effect transistor having an exposed floating gate, wherein the ion sensitive field effect transistor is configured to act as the individually addressable activation element and as a sensor, and wherein the ion sensitive field effect transistor is positioned with the exposed floating gate adjacent to the top auxiliary layer.

61. (Previously presented)The sensing device of claim 60, wherein the top auxiliary layer is a Ta_2O_5 layer.

62. (Previously presented)The sensing device of claim 21, wherein the self-aligned recognition molecules are of a formula:



wherein X is OH, OCH_3, or hydroquinone.

63. (Previously presented - Withdrawn) The sensing device of claim 21, wherein the electrical access is an ohmic contact or a diode-like contact between the individually addressable activation element and the electroactive moieties of the anchoring layer.

64. (Previously presented - Withdrawn) The sensing device of claim 21, wherein the top auxiliary layer and the bottom auxiliary layer are configured to isolate a channel layer of the field effect transistor from a liquid or an electrolyte.

65. (Previously presented - Withdrawn) The sensing device of claim 21, wherein at least one of the top auxiliary layer and the bottom auxiliary layer is configured to passivate an underlying layer or structure.

66. (Previously presented - Withdrawn) The sensing device of claim 21, wherein the top auxiliary layer is configured to cushion a sensitivity of a sensor underneath.

67. (Previously presented - Withdrawn) The sensing device of claim 21, wherein the top auxiliary layer comprises binding sites for the anchoring layer.

68. (Previously presented - Withdrawn) The sensing device of claim 22, wherein the top auxiliary layer and the bottom auxiliary layer are configured to isolate a channel layer of the field effect transistor from a liquid or an electrolyte.

69. (Previously presented - Withdrawn) The sensing device of claim 56, wherein the top auxiliary layer is an oxide layer providing binding sites for a silane-immobilized anchoring layer.